

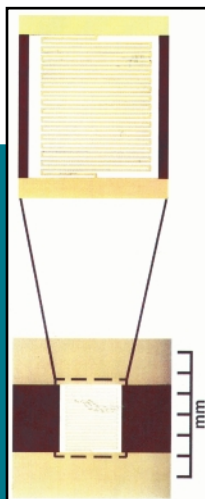
The Lawrence Livermore National Laboratory (LLNL) developed a prototype GC-based system that is:

- Miniature—hardback-book size
- Low-power and portable
- Self-contained
- Based on microelectromechanical systems (MEMS) technology

Possible applications include:

- Traditional GC operations
- “Smart-sensor” applications for
 - Air quality monitoring
 - Manufacturing process control
 - Emission control
 - Plus numerous others

* LLNL is currently looking for industrial partners to assist in the commercialization of this and other technologies. Please note that this is not an offer for sale, but an advertisement of available technology for commercialization.



Thermal conductivity detector.

For information regarding partnering opportunities with LLNL Engineering on the GC system or other technologies, contact:

Rodney D. Kiefer

Assistant Deputy Associate Director for Business Operations
 Electronics Engineering
 Lawrence Livermore National Laboratory
 P.O. Box 808, L-119
 Livermore, CA 94551
 (925) 423-0155
 E-mail: kiefer2@llnl.gov

Hand-held Gas Chromatograph



On-the-spot chemical analysis—could this technology benefit your company?*

This document was prepared as part of work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract W-7405-Eng-48.



Prototype Nominal Technical Specifications

Sampling

- System accepts gas and liquid samples
- System analyzes gas samples containing compound mixtures with boiling points up to 200 °C
- Analysis Time: 30 to 40 seconds for light gases

Detector (MEMS-based)

- Thermal conductivity detector
- Sensitivity: 1.0 ppm for many compounds

Injector System

- 1-2 μL injection volume
- Manual injection (syringe)
- Internal sampling loop ensures a precise sample volume for each cycle

Injector Heater

- Temperature range: 25 °C to 150 °C

Column (MEMS-based)

- High temperature fusion bonded silicon construction
- Cylindrical column 5 meters long and 100 microns in diameter (additional lengths and/or diameters are available)
- Column coatings: DB-1, DB-5, DB-54, and DB-wax are available
- Column operating temperature: 25 °C to 250 °C

Column Heater (MEMS-based)

- Temperature range: 25 °C to 300 °C isothermal or programmable

Carrier Gas

- Self-contained supply: He, H₂ or N₂ Gas is stored in a refillable 40 mL tank at 1000 psi. Carrier gas supply will last for 6 hours of continuous sampling.

Power

- System: 12 VDC, 24 watts maximum
- Battery: Rechargeable internal 12 VDC will last for 2 hours of continuous sampling between charges

Physical

- Dimensions: 8" x 5" x 3"
- Weight: 8 lbs.

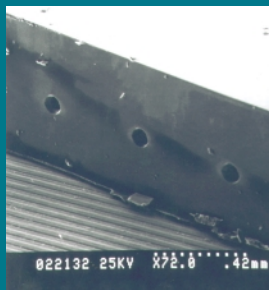
User Interface

- On-board commercial palm-top computer

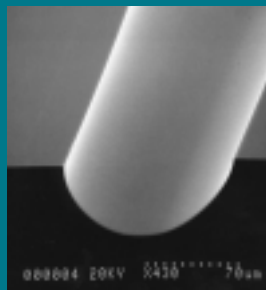


MEMS-based GC unit.

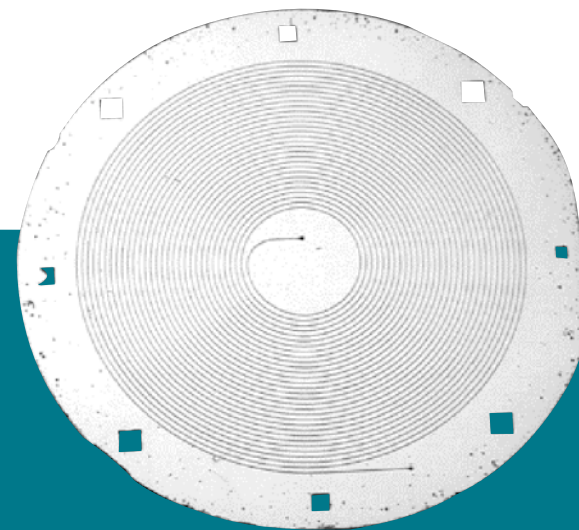
Front Cover Photo: Lead Developer Conrad Yu holds one version of the prototype portable gas chromatograph.



Cross-section of bonded silicon column.



Semi-circular etch column before the two halves are bonded together.



The column for the miniature gas chromatograph has been reduced to two silicon wafers bonded together. Here, one wafer is shown with its coiled groove 100 micrometers wide and several meters long.